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| **Title: DNA Extraction Lab** | **Grade Level: 9** |
| **Objectives:**  SWBAT describe how DNA looks the same from one organism to another.  SWBAT identify how certain ingredients act on the cell.  SWBAT relate their experiment to genetic engineering and explain the benefits of genetic engineering today. | |
| **Illinois Learning Standards:**  Stage H, 11-A – Students who meet the standard know and apply the concepts, principles, and processes of scientific inquiry.  Descriptor: 1) Formulate issue specific hypothesis, generating inquiry questions for an issue investigational premise, differentiating qualitative and quantitative data and their applicability, using conceptual/mathematical/physical models, or previewing associated research.  Stage I, 12-A – Students who meet the standard know and apply concepts that explain how living things function, adapt, and change.  Descriptor 3) Apply scientific inquiries or technological designs to explain the molecular nature of the genetic code, explaining the function, chemical reactions, and schematic diagrams of the molecular components of DNA, RNA and simple proteins, exploring the processes of recombinant DNA research, describing the role of chromosomes in the normal and aberrant display of hereditary traits, mutations and disease. | |
| **Engagement:** The simple act of getting to crush up strawberries and bananas should get students active in this experiment as well as the chance to actually see the DNA they’ve been learning about. | |
| **Exploration**: Illustrating what they see and describing it. | |
| **Explanation:** Explain why/why not hypothesis was correct/incorrect. Should realize that what they see is only the basic structure, not the detailed structure they get to see in books and therefore looks the same at this point. | |
| **Elaboration:** How their experiment ties into the foods they eat and the science behind making those foods. | |
| **Evaluation(Assessment Strategies):**  Thoroughness of answers to questions and understanding behind those answers. Teacher evaluation of completing and participating in the lab. | |
| **Rationale:**  Students will be able to finally take the abstract learning of DNA and get to experience seeing it. It will help the concept become more concrete in their minds and relate the material to real world issues and science they experience every day. | |
| **Resources:**  Lesson Plans Inc. (2010). *DNA Extraction Lab.* Retrieved from <http://www.lessonplansinc.com/lessonplans>. | |

Time Length: 60 minutes

Background Knowledge: The soap is for dissolving the lipid bilayer around the cell nucleus. The salt neutralizes the DNA charge. DNA is soluble in water, therefore alcohol is used because DNA is not soluble in alcohol. Students should be told to ignore the bubbles when observing their samples under microscope and look for the other things present.

Student Knowledge: Students have learned about all the parts and functions of the cell and are getting through their unit on genetics.

Set-up: One station should have the alcohol on an ice-bath, preferably in bottles that students can easily squeeze the alcohol into their test tube. Another station should have the master buffer solution. Should be enough for each group to 8 mL. Buffer solution should be made in a large flask and set up for students in 100 mL beakers.

Accommodations: Students may be allowed to take questions home if necessary, but the procedures should be finished in lab.

DNA Extraction Lab

Problem: Does DNA have the same structure in different organisms?

Hypothesis:

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Materials

* Strawberries
* Bananas
* Cheesecloth
* Small funnel
* 90% Ethanol (ice-cold)
* Graduated cylinder
* Large test tubes
* Zip-lock freezer bags
* 1L Erlenmeyer flask and 100 mL beaker
* 10 mL graduated cylinder
* 8 mL DNA buffer
  + 50 mL dish soap
  + 15 g salt
  + 900 mL tap water
* Glass stirring rod
* Safety goggles
* Metal loop
* Microscope
* Slide and cover

Procedures:

1. In groups of 3, one student assists, one student is in charge of strawberry DNA, one student in charge of banana DNA. Goggles are to be worn until you have finished cleaning.
2. Place one strawberry/banana in a zip-lock bag, press all the air out before sealing it. Mash the strawberry/banana with your fingers for 1-2 minutes until it is puree.
3. Add 8 mL of buffer to the strawberry/banana and press air out of bag before sealing.
4. Mash strawberry/banana carefully for 1 min without making many bubbles.
5. Place test-tube in a cup with the funnel on top of the test tube. Place cheesecloth over funnel.
6. Cut one corner of the zip-lock bag and carefully drain the strawberry/banana mixture onto cheesecloth until the test-tube is ¼ full. This step make take a while because the juice should drain through the cheesecloth and the chunks should not.
7. Tilt test tube at a 45o angle and pour the alcohol through the funnel down the side of the tube until your tube is ½ full or, in other words, so that you have as much juice as you do alcohol.
8. Place test-tube at eye level. Stir, with the glass rod, only the clearer layer on top of the juice carefully. Pull out rod and examine the tube for what you see and illustrate in the diagram below.
9. With the metal loop, dip it into the top layer and slowly stir until you can pull it out with part of the layer attached which looks mucus-like. Spread this on the slide and allow to dry for a couple minutes.
10. Put a cover slip on the sample and examine under the microscope and illustrate what you see in the diagram below. Note: you should only have to use the lowest and middle power to examine, do not use high power.
11. Once you have finished your drawings and observations, zip-lock bags, cheesecloth and extra fruit mixture can be thrown in designated trash can. All equipment must be properly cleaned and left to dry for the next group of students. Wipe down tables and microscopes and unplug the microscopes.

Variables:

Independent variable\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent variable\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Illustrations:



Description:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



Description:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Conclusion:

Was your hypothesis correct? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Why or why not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What did you learn from this experiment?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Why was soap in the buffer?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Why was salt in the buffer?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Most fruits and vegetable are genetically modified today. What steps from this experiment would be similar to a step a scientist would have to do to modify a plant?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Give 4 benefits of genetically engineering food plants and explain.

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